

**We Claim:**

1. A method of operating a page width ink jet printhead within a predetermined thermal range to print an image, said printhead comprising:

5 an array of nozzles formed on a substrate, each nozzle including a nozzle opening, an associated displaceable thermal actuator for ejecting ink through said nozzle opening, an ink chamber and an activation unit for controlling operation of said actuator;

at least one temperature sensor attached to said substrate for sensing the temperature of said substrate;

10 a temperature determination unit connected to said at least one temperature sensor; and,

an ink ejection drive unit coupled to said temperature determination unit and to said printhead;

said method including the steps of:

15 (a) sensing the temperature of said substrate with said at least one temperature sensor and said temperature determination unit;

(b) said ink ejection drive unit determining if said temperature is below a predetermined threshold;

20 (c) if said temperature is below said predetermined threshold, performing a preheating step of heating said actuators so that the printhead is heated to a temperature above said predetermined threshold;

(d) controlling said preheating step such that said thermal actuators are heated by pulses of energy that are insufficient to cause the ejection of ink from said printhead and tuning a duration of said pulses in accordance with a composition of said ink; and,

25 (e) utilizing said printhead to print said image.

2. The method as claimed in claim 1, wherein the energy of said pulses in said preheating step is less than 160nJ and the ejection of one ink drop from one said nozzle requires at least 160nJ.

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3. The method as claimed in claim 1, wherein ejection of one ink drop from one said nozzle requires between 160 and 190 nJ.

4. The method as claimed in claim 1, further including the steps of:
  - (aa) initially sensing an ambient temperature surrounding said printhead; and
  - (ab) setting said predetermined threshold to be said ambient temperature plus a predetermined operational factor amount, said operational factor amount being dependent on said ambient temperature.
5. The method as claimed in claim 1, further including the step of:
  - (f) monitoring said printhead temperature whilst printing said image and when said temperature falls below said predetermined threshold, reheating said actuators to again raise the temperature of said printhead above said predetermined threshold.
6. The method as claimed in claim 1, wherein said step (b) comprises constantly monitoring said printhead temperature whilst heating said printhead.
- 15 7. The method as claimed in claim 1, further including the step of tuning said duration of said energy pulses to compensate for changes in viscosity of said ink with temperature.
- 20 8. The method as claimed in claim 7, further comprising retrieving viscosity/temperature relationship data stored in an authentication chip associated with said ink.
9. A page width ink jet printhead comprising:
  - 25 an array of nozzles formed on a substrate, each nozzle including a displaceable thermal actuator for ejecting ink on demand through a nozzle opening of its associated nozzle;
  - an activation unit for each nozzle for controlling operation of said actuators,
  - at least one temperature sensor attached to said substrate for sensing the
- 30 temperature of said substrate;

a temperature determination unit connected to said at least one temperature sensor;

an ink ejection drive unit coupled to said temperature determination unit and to said printhead;

5       wherein, before an ink ejection operation is begun, said temperature determination unit utilizes an output from said at least one temperature sensor to sense a current temperature of said substrate, and if said temperature is below a predetermined threshold, said ink ejection drive unit outputs a preheat activation signal to generate pulses of energy to heat each said thermal actuator to an extent sufficient to heat said substrate, while being insufficient for the ejection of ink from said array, a duration of 10 said pulses being tuned in accordance with a composition of said ink.

10.     The printhead as claimed in claim 9, wherein a plurality of said temperature sensors are spaced apart on said substrate.

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11.     The printhead as claimed in claim 9, wherein said array of nozzles is divided into a series of spaced apart groups with at least one temperature sensor per group.

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12.     The printhead as claimed in claim 9, wherein the energy of said pulses is less than 160nJ and the ejection of one ink drop from one said nozzle requires at least 160nJ.

13.     The printhead as claimed in claim 9, wherein ejection of one ink drop from one said nozzle requires between 160 and 190nJ.

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14.     The printhead as claimed in claim 9, further comprising an authentication chip associated with said ink for storing viscosity/temperature relationship data to enable the tuning of the duration of the energy pulses to compensate for changes in viscosity of said ink with temperature.

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15.     The printhead as claimed in claim 9, wherein each said activation unit comprises a heater element external to said ink chamber of each said nozzle for heating said actuator.